U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

03-OSR-0076

Mr. R. F. Naventi, Project Manager
Bechtel National, Inc.
2435 Stevens Center
Richland, WA 99352

Dear Mr. Naventi:

APPROVAL OF AUTHORIZATION BASIS CHANGE NOTICE (ABCN) 24590-WTP-ABCN-ESH-02-027, REVISION 0, TO THE HIGH LEVEL WASTE (HLW) PRELIMINARY SAFETY ANALYSIS REPORT (PSAR)

References:

1. ORP letter from R. J. Schepens to R. F. Naventi, BNI, "U.S. Department of Energy (DOE) Notice to Proceed with Construction Activities," 02-OSR-0517, dated November 13, 2002.

2. BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Transmittal for Approval - Authorization Basis Change Notice 24590-WTP-ABAR-ESH-02-027, Revision 0, *Revision to HLW PSAR to Reflect Proposed Design Modifications to Melter Pour Spout and Vessel Stub Outs,*" CCN-038761, dated September 11, 2002.

3. ORP letter from R. J. Schepens to R. F. Naventi, BNI, "Delay for Approval of Authorization Basis Change Notice (ABCN) 24590-WTP-ESH-02-027, Rev. 0, Revision to High Level Waste (HLW) Preliminary Safety Analysis Report (PSAR) to Reflect Proposed Design Modifications to Melter Pour Spouts and Vessel Stub Outs," 02-OSR-0494, dated October 21, 2002.

This letter conditionally approves the subject ABCN in its entirety. This letter also modifies the Construction Authorization Agreement provided by Reference 1. BNI provided the subject ABCN to the U.S. Department of Energy, Office of River Protection (ORP) on September 11, 2002 (Reference 2) and requested the proposed changes be included with the HLW PSAR review for full facility construction authorization. ORP responded (Reference 3) that, due to the late submittal of the request and the adverse impact to the HLW construction authorization request (CAR) review, DOE would not review the ABCN until after completion of the HLW CAR review.

The ABCN (24590-WTP-ABCN-ESH-02-027) proposed to replace the HLW pour tunnel bogie interlock loop with a drip tray for each melter spout to prevent glass spills due to an inadvertent pour when a canister is not present under a pour spout, and the addition of piping loops to each concentrate receipt vessel to allow for the potential future installation of transfer devices in the event of failure of all installed reverse flow diverters in a vessel.

Based on the information in Reference 2, in subsequent communications with BNI staff, and in the enclosed Safety Evaluation Report, the changes are conditionally acceptable, as noted; there is reasonable assurance that the health and safety of the public, the workers, and the environment will not be adversely affected by those changes, and that they comply with applicable laws, regulations, and Waste Treatment and Immobilization Plant contractual requirements.

The conditions described in the attached SER must be reflected in the HLW PSAR as part of its next scheduled update. These conditions have been discussed with BNI staff and found to be acceptable.

If you have any questions, please contact me, or your staff may call Lewis F. Miller, Jr., WTP Safety Regulatory Division, (509) 376-6817.

Sincerely,

Roy J. Schepens
Manager

OSR:RWG

Enclosure

**Safety Evaluation Report (SER)
of Proposed Authorization Basis Change Notice (ABCN)
24590-WTP-ABCN-ESH-02-027, Rev. 0
to the High Level Waste (HLW)
Preliminary Safety Analysis Report (PSAR)
for the Waste Treatment and Immobilization Plant (WTP)**

1.0 INTRODUCTION

The WTP authorization basis is the composite of information provided by a Contractor in response to radiological, nuclear, and process safety requirements that is the basis on which the U.S. Department of Energy, Office of River Protection (ORP) grants permission to perform regulated activities. The authorization basis includes that information requested by the Contractor for inclusion in the authorization basis and subsequently accepted by the ORP. The authorization basis for the WTP includes the HLW PSAR. The PSAR describes the analyzed safety basis for the facility (safety envelope), demonstrates that the facility will perform and be operated such that the radiological, nuclear, and process safety requirements are met, and demonstrates adequate protection of the public, workers, and the environment. The PSAR is based on the preliminary design of the HLW facility and is part of the authorization basis for facility construction. By letter dated September 11, 2002,[1] Bechtel National, Inc., (the Contractor) submitted a proposed amendment to the HLW PSAR. This SER documents the ORP evaluation of the changes proposed by the Contractor in the areas of HLW melter design and the addition of concentrate receipt vessel spare process lines (coaxial containment piping).

The amendment proposes the following changes to the HLW facility design:

- Replace the pour tunnel bogie interlock loop with a drip tray for each melter pour spout to prevent glass spills due to an inadvertent pour when a canister is not under a pour spout

- Add piping loops to each HLW concentrate receipt vessel to allow for the potential future installation of transfer devices in the event of failure of all installed reverse flow diverters in any vessel. Those portions of the spare piping loops penetrating the wet process cell wall into shielded wall bulges will be contained within a secondary pipe (pipe in pipe).

2.0 BACKGROUND

The Integrated Safety Management Plan (ISMP) and Safety Requirements Document (SRD) describe the process for identifying hazards, developing control strategies, and selecting design basis events for the WTP. Section 9.1 of the SRD requires the performance of safety analyses to develop and evaluate the adequacy of the authorization basis for the HLW facility. The PSAR and the Final Safety Analysis Reports shall be prepared to document the HLW facility safety analyses (SRD Safety Criterion 9.1-1). SRD Safety Criterion 9.1-7 requires the hazard analysis for the HLW facility to be submitted for DOE approval as part of the safety analysis report.

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[1] BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Transmittal for Approval - Authorization Basis Change Notice 24590-WTP-ABCN-ESH-02-027, Revision 0, *Revision of HLW PSAR to Reflect Proposed Design Modifications to Melter Pour Spout and Vessel Stub Outs*," CCN: 038791, dated September 11, 2002.

Bechtel National, Inc. (BNI) submitted the HLW PSAR to ORP on February 19, 2002[2] as part of the facility Construction Authorization Request (CAR). During the period of ORP review of the HLW CAR request, BNI submitted ABCN 24590-WTP-ABCN-ESH-02-027 requesting the proposed changes be included with the HLW PSAR review for full facility construction authorization. ORP responded[3] that, due to the late submittal of the request and the adverse impact to the ongoing HLW CAR review, ORP would not begin review of the ABCN until October 25, 2002. The initiation of this review was delayed by efforts to complete and issue the SER for the HLW CAR, and subsequently, by higher priority BNI requests for changes in WTP fire protection design requirements.

The HLW PSAR submitted with the CAR credited the pour tunnel bogie interlock loop as SDS structures, systems, and components (SSC) that prevented the bogie from pulling away from the pour spout during a molten glass pour. ABCN 24590-WTP-ABCN-ESH-02-027 proposed to delete this interlock loop and replace it with a melter pour spout drip tray. The function of the drip tray is to move underneath the melter pour spout whenever a canister is not in place to mitigate a glass spill in the melter pour cave in the event of an inadvertent discharge of glass from the melter. The melter pour spout drip tray will be designed with an engineered air gap between the top of the drip tray and the bottom of the melter pour spout to ensure solidification of any molten glass inadvertently discharged from the melter and provide for bulk confinement of the molten glass. The glass spill design basis event (DBE) was reanalyzed by BNI in the ABCN to reflect this change and demonstrate the adequacy of the controls.

The spare process loops (pipe in pipe) proposed by ABCN 24590-WTP-ABCN-ESH-02-027 do not replace an existing important-to-safety (ITS) SSC credited in the HLW PSAR, but rather introduce a new ITS SSC that provides for the potential future installation of transfer devices in the event of failure of all installed reverse flow diverters in the concentrate receipt vessels. The spare process loops penetrate the wet process cell wall into shielded wall bulges and are contained within a secondary pipe (pipe in pipe). BNI performed DBE analysis to demonstrate the adequacy of these controls.

Based on the results of Integrated Safety Management (ISM) evaluations and the definition and analysis of new or revised DBEs for which it is demonstrated that, with controls, the SRD exposure standards are met and adequate safety is achieved, the Contractor requested approval to revise the project authorization basis to incorporate the changes proposed by 24590-WTP-ABCN-ESH-02-027.

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[2] BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Request for Review and Approval of the Construction Authorization Request for the Hanford Tank Waste Treatment and Immobilization Plant, Revision H," CCN: 027639, dated February 19, 2002.

[3] ORP letter from R. J. Schepens to R. F. Naventi, BNI, "Delay for Approval of Authorization Basis Change Notice (ABCN) 24590-WTP-ABCN-ESH-02-027, Rev. 0, *Revision to High Level Waste (HLW) Preliminary Safety Analysis Report (PSAR) to Reflect Proposed Design Modifications to Melter Pour Spout and Vessel Stub Outs*," 02-OSR-0494, dated October 21, 2002.

3.0 EVALUATION

3.1 Proposed Changes to HLW PSAR, Chapter 2.0, Facility Description:

- Revise Section 2.4.11.1 to include a description of the wet process cell bulges with spare process piping loops

- Revise Section 2.5.2.6 to include a description of the melter pour spout drip tray.

Section 2.4.11.1 of the HLW PSAR provides a description of the wet process cell, including rooms H-B014 and H-B013. ABCN 24590-WTP-ABCN-ESH-02-027 proposes to revise this section to identify the cell to include two process bulges located on the west side at the –21 ft level. The description also identifies these anchored bulges as providing shielding of the spare process piping that extends outside the cell to accommodate possible future transfer equipment for System HCP (HLW Cave Receipt Process System) process transfers. Section 2.5.2.6 of the HLW PSAR provides a description of the HLW melter glass pour spout. ABCN 24590-WTP-ABCN-ESH-02-027 proposes to revise this section to identify that, when a canister is not engaged beneath the glass pour spout, a melter pour spout drip tray moves to a closed position beneath the glass pour spout.

Evaluation (acceptable): The revised facility and process descriptions were reviewed against criteria in RL/REG-99-05, *Review Guidance for the Construction Authorization Request (CAR)*, Section 1.2, "Facility Description," and Section 1.3, "Process Description."[4] The criteria relevant to the scope of 24590-WTP-ABCN-ESH-02-027 require the PSAR to include a general description of the process, general arrangement of the major components of the process, and the process equipment layout.

The reviewers found the proposed revisions to Sections 2.4.11.1 and 2.5.2.6 acceptable because sufficient general information was provided on the facility and process, including the general arrangement, function, and operation of major components of the HLW process, to support understanding of the hazard and accident analyses and the selection of design basis events.

3.2 Proposed Changes to HLW PSAR, Chapter 3.0, Hazard and Accident Analyses:

- Revise Section 3.3.3.2, HLW Receipt, Blending, and Feed Process Hazard Evaluation Results, to identify control strategies to minimize the risk of loss of piping confinement and subsequent release of radioactive slurry outside of the wet process cell.

- Revise Section 3.3.3.3, HLW Melter and Offgas Treatment Systems Hazard Evaluation Results, to identify the design of a melter pour spout drip tray as a control strategy for minimizing the risk of melter confinement or glass pour failure and the deletion of the bogie interlock with melter pour/airlift cycle control strategy.

[4] RL/REG-99-05, *Review Guidance for the Construction Authorization Request (CAR)*, Rev. 3, dated July 2001.

- Add a new DBE to Section 3.4.1.1.2.1 to address liquid spills associated with the spare process piping loop.

- Modify the discussion of the molten glass spill accident (Section 3.4.1.4.2) to remove references to the bogie interlock and replace with references to the melter pour spout drip tray.

Evaluation (conditionally acceptable): The purpose of this review was to determine (1) whether the PSAR adequately described the hazard and accident analyses performed for the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027 and (2) whether the analyses complied with the requirements of the SRD and were consistent with the commitments of the ISMP. The review also was to determine whether the analyses demonstrated that the HLW facility construction, operation, maintenance, and deactivation could be performed in a manner that adequately protects the health and safety of the workers, the public, and the environment.

In accordance with SRD, Volume II, Appendix A, Section 4.0, "Hazard Evaluation," the PSAR was to address the following nine elements of hazard and accident analysis: (1) identifying hazards, (2) identifying potential accident/event sequences, (3) estimating accident consequences, (4) estimating accident frequencies, (5) considering common-cause and common-mode failures, (6) defining DBEs, (7) defining the operating environment, (8) identifying potential control strategies, and (9) documenting the hazard evaluation.

The reviewers evaluated the HLW facility-specific hazard and accident analysis in 24590-WTP-ABCN-ESH-02-027 as it pertained to construction of the HLW facility. Specifically, the reviewers evaluated the information provided in proposed changes to HLW PSAR Chapter 3 and Appendix A. The reviewers also evaluated PSAR references to assess the scope, breadth, and depth of the detailed information underlying the discussion and to determine the completeness and accuracy of the underlying information in supporting the conclusions. These references included calculations 24590-HLW-U4C-U78T-00001[5] and 24590-HLW-Z0C-HMP-00001[6].

The reviewers found seven of the nine criteria acceptable and two criteria conditionally acceptable for approval of the HLW facility changes proposed by ABCN 24590-WTP-ABCN-ESH-02-027. The evaluation of the information for each review criterion is summarized below:

1. **Identifying Hazards** – The reviewers found the identification of hazards in 24590-WTP-ABCN-ESH-02-027 conditionally acceptable. The reviewers evaluated the proposed changes to PSAR Chapter 3 and the CSD records in Appendix A. The reviewers evaluated the results of the identification of hazards associated with the spare process piping that extends outside the wet process cell to accommodate possible future transfer equipment for System HCP process transfers and with the melter pour spout drip tray, including potential consequences, possible causes, and estimated initiating frequencies. The reviewers found that the radiological hazards associated with the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027 and in response to an ORP

[5] 24590-HLW-U4C-U78T-00001, Design Basis Event – Liquid Spills, Rev. C, dated August 19, 2002.
[6] 24590-HLW-Z0C-HMP-00001, Design Basis Event: High Level Waste Molten Glass Spill, Rev. C, dated August 19, 2002.

question (Question HLW-PSAR-260) were identified systematically according to the SRD, Appendix A, Section 4.1, "Identification of Hazards." The hazards associated with the proposed changes, including the potential for liquid spills outside the wet process cell, were identified in the proposed revisions to PSAR Appendices A (Hazards Assessment Report; Standards Identification Process Database Output) and B (Hazards Affecting the Walls to Grade Design).

Reviewers questioned (Question HLW-PSAR-260) the basis upon which BNI concluded that adequate safety is maintained given the potential for hydrogen build-up in the spare process lines (concentrate receipt vessel stub out lines) if the normally operating non-important-to-safety (ITS) process air purge through these lines were to fail. BNI responded that ITS Purge Air will be provided to the spare process lines (HCP-PC-00075-S12 and HCP-PC-00093-S12) to ensure the hydrogen concentration is maintained below flammable limits. BNI committed to update the HLW PSAR at the next revision to clarify the inclusion of ITS purge air into these lines. The reviewers found this response acceptable because it clarified the application of the ITS process air system. In its response to Question HLW-PSAR-260, BNI also committed to delete the ABCN proposed addition to HLW PSAR Section 3.4.1.1.2.6, that read: "Subsequent failure of the secondary pipe, should the primary pipe leak, is not eminent (sic) within a reasonable time frame for detection of the primary pipe leak via the cell leak detection system." Since this statement was meant to address target frequency and the requirements for target frequency have been eliminated (24590-WTP-ABCN-ESH-02-019, approved by 02-OSR-0449), the reviewers found this response acceptable.

2. **Identifying Potential Accident/Event Sequences** – The reviewers found the approach to identifying potential accidents/event sequences (i.e., liquid spills from vessels/piping and molten glass spills) acceptable. The reviewers evaluated the proposed revisions to PSAR Chapter 3 and the Appendix A CSD records for the changes to the HLW facility proposed by ABCN 24590-WTP-ABCN-ESH-02-027. The CSD records included information on the potential consequences, a summary of their hazardous situations or sequences, estimated initiating frequencies, control strategy elements, and safety case requirements (SCRs) of engineering features for each hazard. For example, process lines within bulges will be pipe-in-pipe to ensure confinement, secondary pipe will drain to a dedicated area, bulges will physically protect the process piping and will provide adequate shielding, the melter pour spout drip tray is in the closed position when a canister is not present, and the air gap between the top of the drip tray and bottom of the melter pour spout is minimized to prevent leakage. PSAR Section 3.3.3 summarized potential hazardous situations or accident sequences for the SSCs by their location. This included PSAR Sections 3.3.3.2 for liquid spills or spray releases from piping or vessel and 3.3.3.3 for release of molten glass from the melter.

3. **Estimating Accident Consequences** – The reviewers found the approach to estimating accident consequences acceptable. The reviewers evaluated the changes to PSAR Chapter 3 and the CSD records in Appendix A for the HLW facility changes proposed by 24590-WTP-ABCN-ESH-02-027. The evaluation considered the description of the results of the calculated unmitigated and mitigated consequence analysis for the potential accident/event sequences associated with the process, design, and operation hazards

associated with 24590-WTP-ABCN-ESH-02-027 that could affect the facility. In estimating accident consequences, conservative source term assumptions were applied as described in the PSAR supporting document 24590-PTF-M4C-V11T-00003 and supporting calculations 24590-HLW-U4C-U78T-00001 and 24590-HLW-Z0C-HMP-00001.

Unmitigated consequence severity level calculations (24590-HLW-Z0C-W14T-00013) were performed for facility hazardous situations/events, including liquid spills and molten glass spills. The reviewers evaluated the specific HLW facility scenarios analyzed for the changes proposed by 24590-WTP-ABCN-ESH-02-027, the assumptions used, and the results of the unmitigated consequence calculations. The proposed changes resulted in the identification of 15 new hazardous situations/events for liquid (10) and molten glass (5) spill events. Estimated consequences to the facility worker and co-located worker for these hazardous situations/events were as high as SL-1 and estimated consequences to the public were as high as SL-3. The reviewers determined that the unmitigated consequence calculations for these hazardous situations/events were acceptable according to the SRD, Appendix A, Section 4.3.1, "Accident Severity Level Identification," for the following reasons: (1) consequences accounted for type, form, and quantity of radioactive material and the energy sources available to interact with the hazardous material; (2) no credit was taken for mitigative or preventive controls; and (3) the consequences were evaluated for ground level releases.

ABCN 24590-WTP-ABCN-ESH-02-027 contained mitigated DBE evaluations of two liquid release DBEs (liquid spills outside the wet process cell and a molten glass spill). In addition to these DBE analyses, reviewers evaluated the following supporting documents:

- 24590-HLW-U4C-U78T-00001, *DBE: Liquid Spills*
- 24590-HLW-Z0C-HMP-00001, *Design Basis Event: High Level Waste Molten Glass Spills*.

The reviewers concluded that the appropriate methodology, data, and assumptions were used in the analyses. The analysis results were acceptable and consisted of final control strategy section, mitigated consequences with the credited mitigative and preventive controls, and compliance with SRD Appendix A criteria for meeting the radiation exposure standards of SRD Safety Criterion 2.0-1 and target frequency (initiating event combined with failure of credited controls). The reviewers considered the estimates of mitigated accident consequences for the DBEs acceptable because they met the requirements of SRD Safety Criterion 4.3-2.

4. **Estimating Accident Frequencies** – The reviewers found the approach to estimating accident frequencies for the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027 acceptable. The reviewers evaluated the changes to PSAR Section 3 and the Appendix A CSD records. The reviewers evaluated results of the frequency determinations, based on methodology described in 24590-WTP-GPP-SANA-002C, for

the potential accident/event sequences associated with the process, design, and operation hazards associated with 24590-WTP-ABCN-ESH-02-027.

The reviewers found the description of unmitigated accident frequency acceptable. While the overall facility is unique, the DBE initiating events of concern with 24590-WTP-ABCN-ESH-02-027 (i.e., spills) are common industrial events for which historical information concerning frequency of occurrence is available. The revised PSAR Appendix A CSD records identified hazards, including their initiating event frequencies, which had the potential to produce radiological consequences above SL-4. A component reliability database of available industry data was compiled by the Contractor from a number of sources, including AIChE's Center of Chemical Process Safety, the Westinghouse Savannah River Company, EG&G Idaho, Inc., the International Atomic Energy Agency, and the Institute of Electrical and Electronics Engineers. This database was used for estimating initiating event frequencies.

The reviewers found the description of mitigated accident frequency acceptable. For the analyzed DBEs in 24590-WTP-ABCN-ESH-02-027, the selected control strategies were both preventive (e.g., liquid spill outside the wet process cell) and mitigative (e.g., liquid spill inside the wet process cell and molten glass spill). For the mitigated events, the mitigated frequency was the same as the initiating event or unmitigated accident frequency.

5. **Considering Common-Cause and Common-Mode Failures** – The reviewers determined that the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027 do not impact the selection of common-cause and common-mode failures as described in PCAR Section 3.3.4, PSAR Section 3.5, the Appendix A CSD records, and the results of the hazard analysis in 24590-WTP-RPT-TE-01-002; thus, the proposed changes are acceptable for this evaluation criterion. The previous evaluation of credible common-cause events that could affect the safety functions of the HLW facility included consideration of natural phenomena events, external man-made events, loss of electrical power, fire, internal missiles, and internal flooding. The reviewers determined that the HLW PSAR description and analysis of these events were not impacted by the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027. As such, no changes to the conclusions and conditions of acceptance for the consideration of common-cause and common-mode failures as documented in the current HLW PSAR SER were necessary for the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027.

6. **Defining DBEs** – The reviewers found the set of DBEs identified in 24590-WTP-ABCN-ESH-02-027 for the HLW building acceptable. Based on the ISM process, the selection of internal DBEs for HLW was described in 24590-WTP-RPT-TE-01-002. For liquid spills, the PSAR selected the failure of a HLW concentrate receipt vessel as the bounding or worst-case accident, with SL-1 unmitigated consequences to the facility and co-located workers and SL-3 unmitigated consequences to the public. This DBE selection was not affected by the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027 and was determined acceptable by the reviewers. Liquid spills outside of the wet process cell were prevented by the pipe-in-pipe design of the concentrate receipt vessels spare process lines, wherein both pipes were classified Safety Design Class (SDC),

Seismic Category (SC) I, Quality Level (QL) 1, and were designed for a 40-year operating life. Thus, if waste enters the spare process lines due to loss of the process air purge flow and the primary (interior) spare process line fails, the waste drains back to the wet process cell in the sloped secondary process line. The consequences of this event were bounded by the failure of the concentrate receipt vessel. The reviewers agreed with this conclusion.

The reviewers found that 24590-WTP-ABCN-ESH-02-027 acceptably summarized the internal accident sequences identified in the hazard analysis. The identified sequences contained sufficient detail to provide an adequate basis for estimating each accident's consequences and frequency. Each had consequences of at least SL-1, -2, or -3 as defined in the SRD, Appendix A, "Implementing Standard for Safety Standards and Requirements Identification." The reviewers also found that the proposed changes to HLW PSAR Volume IV, Chapter 3 and Appendix A, along with the referenced calculations, provided (1) comprehensive and credible accident sequences that identified initiating events with their prevention and mitigation measures, and other contributing phenomena, and (2) the rationale for sorting hazardous situations into accident groups or categories (e.g., liquid spills and molten glass spills).

The previous PSAR review for HLW facility construction authorization determined that the PSAR provided conditionally acceptable information, supplemented by the responses to questions relative to design and analysis of the facility for external DBEs, including seismic and other external facility phenomena and events (e.g., wind, missiles due to wind, flooding, volcanic ash, snow, and postulated aircraft crashes). Since the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027 do not involve external events, the previous SER conclusions concerning the conditional acceptability of the HLW PSAR description and analysis of external events are unchanged.

7. **Defining the Operating Environment** – The reviewers determined that the HLW operating environment (PSAR Table 3-23) was not impacted by the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027; thus, the proposed changes are acceptable for this evaluation criterion. PSAR Table 3-23 listed parameters, including pressure and temperature, in affected parts of the facility following the occurrence of each analyzed DBE. The reviewers concluded that the operating conditions under which the ITS SSCs identified in 24590-WTP-ABCN-ESH-02-027 must function were not significantly affected by either internal or external DBEs, including the DBEs addressed by 24590-WTP-ABCN-ESH-02-027.

8. **Identifying Potential Control Strategies** – The reviewers found the identification of potential control strategies conditionally acceptable. The reviewers evaluated the changes to HLW PSAR Sections 3.3 and 3.4 proposed by 24590-WTP-ABCN-ESH-02-027 and the associated Appendix A CSD records, including control strategy elements and safety case requirements identified in the CSD records. The evaluation focused on the description of the potential hazard control strategies that were identified to control potential accidents as well as the final control strategies selected for the analyzed DBEs. The PSAR changes included with 24590-WTP-ABCN-ESH-02-027 identified the potential control strategies for mitigating consequences of the selected DBEs. Final

control strategies identified by 24590-WTP-ABCN-ESH-02-027 for mitigating the liquid spill and molten glass spill (inadvertent pour while a canister is not present) DBEs included existing control strategies (i.e., the wet process cell structure, C5 ventilation system, and the melter cave and pour tunnel concrete structure) and new control strategies (i.e., the design and materials selection for the spare process piping, design of the process bulges, and the melter pour spout drip tray).

The proposed design of the melter pour spout drip tray included, as a design feature, an air gap between the top of the drip tray and the bottom of the pour spout to provide bulk confinement of molten glass. During discussions with BNI personnel concerning the technical basis for concluding that the air gap would provide the intended bulk confinement function, BNI was unable to provide such a basis. BNI committed to either perform a confirmatory calculation or provide documentation based on melter experience with similar designs. BNI further committed to complete the analysis or document the basis for the bulk confinement function and to include it in the next scheduled HLW PSAR update. The reviewers found this commitment acceptable because confirmation of this HLW safety design feature can be verified during review of the PSAR update, allowing time for further design changes, if necessary.

9. **Documenting the Hazard Evaluation** – The reviewers found the documentation of the facility hazard evaluation for the changes to the HLW facility proposed by 24590-WTP-ABCN-ESH-02-027 acceptable. Pursuant to the SRD, Appendix A, Section 4.9, "Documentation," the reviewers evaluated the documentation of the HLW facility hazard evaluation as presented in PSAR Chapter 3 and the Appendix A CSD records. The reviewers determined this documentation of the hazard and accident analysis results was acceptable and consistent with the current status of the facility and process design.

3.3 Proposed Changes to HLW PSAR, Chapter 4.0, Important to Safety Structures, Systems, and Components:

- Incorporate wet process cell bulges into the facility structure information (Section 4.3.1)
- Incorporate the spare process piping into the HLW vessel information (Section 4.3.7)
- Remove references to the bogie interlocks associated with unconfined glass pours (Section 4.4.12)
- Add a new section (4.4.14) discussing the safety function of the HLW melter pour spout drip tray.

Evaluation (conditionally acceptable): The purpose of this review was to determine whether the changes to HLW PSAR Sections 4.0 and 5.0 proposed by ABCN 24590-WTP-ABCN-ESH-02-027 adequately identified and described the HLW facility ITS SSCs, their safety function, and the resulting functional requirements. The reviewers evaluated whether the changes to HLW PSAR Sections 4.0 and 5.0 proposed by ABCN 24590-WTP-ABCN-ESH-02-027 adequately determined and documented each HLW facility ITS SSC's (1) identification, (2) safety function,

(3) system description, (4) functional requirements, (5) system evaluation, and (6) controls (TSRs).

The reviewers found the identification of HLW ITS SSCs conditionally acceptable based on review of the identification and performance requirements of the ITS SSCs documented in 24590-WTP-ABCN-ESH-02-027. The reviewers found the information acceptably met four of the six evaluation criteria and conditionally met two evaluation criteria as summarized below:

1. **SSC Identification** – The reviewers found the identification of SSCs acceptable. SSCs designated SDC and Safety Design Significant (SDS) were identified and described in ABCN 24590-WTP-ABCN-ESH-02-027 for the proposed changes to the HLW facility. The following existing and new SSCs were designated SDC:

   - Wet process cell concrete structure (existing)
   - C5 area ventilation exhaust system (existing)
   - Spare (pipe in pipe) process piping (new)
   - Process bulge (new)
   - Cave and pour tunnel concrete structure (existing).

   By examining the DBEs described in ABCN 24590-WTP-ABCN-ESH-02-027 and the hazard and accident analysis results related to those DBEs, the reviewers concluded that all SDC SSCs were adequately defined and described. Specifically, the reviewers concluded that the list of SDC equipment was complete and that the safety function of each SSC was clear and adequate. The reviewers also concluded that the SDC classifications for the SSCs listed above were in accordance with SRD Safety Criterion 1.0-8. In addition, the system description for the hazard controls, their functional requirements, applicable standards, and draft operations controls (TSRs) combined to adequately control the hazards associated with the DBEs.

   However, the reviewers questioned (Question HLW-PSAR-260) why HLW PSAR Table 4-1 was not changed to include the SDC SSCs (e.g., bulges, spare process piping) added by the ABCN. BNI responded that the added SSCs were not considered major components. BNI committed to revise the appropriate section of Table 4-1 at the next scheduled PSAR update to identify the SDC bulge and SDC lines (primary and secondary), to be consistent with the ABCN text descriptions. This was acceptable to the reviewers.

   The HLW melter pour spout drip tray was designated as an SDS SSC. The reviewers found this identification acceptable. By reviewing the molten glass spill DBE analysis documented in ABCN 24590-WTP-ABCN-ESH-02-027 and the hazards and accident results related to this DBE, the reviewers found that the safety function of the HLW melter pour spout drip tray was adequately defined and described. The reviewers concluded that the SDS classification for the HLW melter pour spout drip tray was in accordance with SRD Safety Criterion 1.0-8.

The HLW wet process cell sump, level detection, sump liner, and sump ejector were identified as Risk Reduction Class (RRC) SSCs. The review for the HLW facility construction authorization previously found this identification of RRC SSCs acceptable.

2. **Safety Function** – The reviewers found the description of the safety functions of SSCs designated SDC and SDS listed above acceptable, as described in 24590-WTP-ABCN-ESH-02-027. The changes to HLW PSAR, Volume IV, Chapter 4 proposed by 24590-WTP-ABCN-ESH-02-027 included a section that described the credited safety function for each SDC and SDS SSC identified.

3. **System Description** – The reviewers found the system descriptions of the SSCs designated SDC and SDS listed above acceptable, as described in the changes to HLW PSAR, Volume IV, Chapter 4 proposed by 24590-WTP-ABCN-ESH-02-027. The changes included a section that described each SDC and SDS SSC identified. The reviewers found the descriptions complete and adequate. The reviewers concluded that the system descriptions for SDC and SDS SSCs were consistent with the requirements of the SRD. No new RRC SSCs were added to the HLW facility design by the changes proposed by ABCN 24590-WTP-ABCN-ESH-02-027.

4. **Functional Requirements** – The reviewers found the functional requirements of the SSCs designated SDC and SDS listed above acceptable, as described in the changes to HLW PSAR, Volume IV, Chapter 4 proposed by 24590-WTP-ABCN-ESH-02-027. For each SDC and SDS SSC identified, the Chapter 4 changes included a section that described the functional requirements of the SSC.

5. **System Evaluations** – The reviewers found the system evaluations of the SSCs designated SDC and SDS listed above acceptable, as described in the changes to HLW PSAR, Volume IV, Chapter 4 proposed by 24590-WTP-ABCN-ESH-02-027. For each SDC and SDS SSC identified, the Chapter 4 changes included a section that evaluated the functional requirements versus the proposed design information for the SSC and integrated safety systems. The reviewers found the evaluations complete and adequate. The reviewers concluded that the system evaluations for SDC and SDS SSCs were consistent with the requirements of the SRD. No new RRC SSCs were added to the HLW facility design by the changes proposed by ABCN 24590-WTP-ABCN-ESH-02-027.

6. **Controls (TSRs)** – The reviewers found the identification of controls (TSRs) conditionally acceptable. ITS SSCs included with the changes to HLW PSAR, Volume IV, Chapter 4 proposed by 24590-WTP-ABCN-ESH-02-027 did not include any TSRs. The reviewers evaluated the adequacy of the bases for not requiring TSRs for the new ITS SSCs addressed by 24590-WTP-ABCN-ESH-02-027 as described in the changes proposed to PSAR, Volume IV, Chapter 5. The SSCs considered included the HLW melter pour spout drip tray and spare (pipe in pipe) process piping (passive design features for which no TSR controls were required) and the wet process cell bulges (facility structure design feature). The reviewers concluded that, except as discussed below, the ITS SSCs added to the HLW facility design, as described in the changes to

HLW PSAR, Volume IV, Chapter 4 proposed by 24590-WTP-ABCN-ESH-02-027, were passive design features not requiring TSRs and therefore acceptable.
However, the reviewers questioned (Question HLW-PSAR-260) the basis on which BNI concluded that the slope requirement for the coaxial containment/spare process piping was not a design feature that should have been included in the proposed changes to HLW PSAR Sections 4.3.7.6 and 5.6.2. BNI responded that the slope requirement for this piping will be added as an explicit design feature in HLW PSAR Sections 4.3.7.6 and 5.6.2 during the next scheduled PSAR update. This will be accomplished by revising the PSAR to state that the secondary piping of the concentrate receipt vessel coaxial containment piping will be routed to the wet process cell. This response was acceptable to the reviewers, since the reviewers had determined from review of the ABCN changes to HLW PSAR Sections 2 and 3 that routing of leaks in the primary spare process piping to the wet process cell was the intended functional requirement for the coaxial containment piping.

After reviewers questioned the basis for concluding that the melter pour spout drip tray was a HLW facility design feature that did not require TSRs, BNI committed to revise HLW PSAR Section 5.5 in the next scheduled PSAR update to include draft Limiting Conditions for Operation (LCOs) of the melter pour spout drip tray. These LCOs will include the surveillance requirements for ensuring melter pour spout drip tray operability. The reviewers found this acceptable because identification of the LCOs and surveillance requirements is necessary to ensure the credited safety function of the melter pour spout drip tray.

3.4 Proposed Changes to HLW PSAR, Chapter 5.0, Derivation of Technical Safety Requirements:

- Remove the discussion of the controls (proposed limiting conditions for operation) associated with the bogie interlock for the unconfined molten glass pour event.

- Incorporate a discussion of the design features (which require no TSR controls) associated with the wet process cell bulges and melter pour spout drip tray.

- Revise Table 5-1, Hazard and Accident Analysis and Technical Safety Requirement Cross Reference, to reflect these two design changes.

Evaluation (acceptable): The reviewers' evaluation of the changes to HLW PSAR, Volume IV, Chapter 5 proposed by ABCN 24590-WTP-ABCN-ESH-02-027 is discussed in item 3.3.6 above.

3.5 Proposed Changes to HLW PSAR, Appendix A, Hazards Assessment Report; Standards Identification Process Database Output:

Reflect changes associated with the inclusion of the wet process cell bulges and the melter pour spout drip tray into the HLW facility design, including the following new CSD records:

- CSD-HHCP/N0032 through - HHCP/N0038
- CSD-HHCP/N0040

- CSD-HHCP/N0046 and - HHCP/N0047
- CSD-HHMP/N0027 through - HHCP/N0030
- CSD-HHPH/N0034.

Evaluation (conditionally acceptable): The reviewers' evaluation of the changes to HLW PSAR, Volume IV, Appendix A proposed by ABCN 24590-WTP-ABCN-ESH-02-027 is discussed in Section 3.2, items 1 through 4 above.

3.6 Proposed Changes to HLW PSAR, Appendix B, Hazards Affecting the Walls to Grade Design:

Reflect changes associated with the new CSD records and safety case requirements (SCRs) identified by the ISM process related to the wet process cell bulges and the melter pour spout drip tray. Specifically, Table B-1 was revised to include the new CSD records identified in item 3.5 above applicable to the HLW facility walls to grade.

Evaluation (acceptable): The reviewers' evaluation of the changes to HLW PSAR, Volume IV, Appendix A proposed by ABCN 24590-WTP-ABCN-ESH-02-027, including the CSD record and SCRs, is discussed in Section 3.2, items 1 through 4 above. The reviewers determined that the proposed changes to Table B-1 were consistent with the new SCRs identified in Appendix A, and were therefore acceptable.

4.0 CONCLUSION

On the basis of the considerations described above, ORP has concluded there is reasonable assurance that the health and safety of the public and the workers will not be adversely affected by the proposed changes. The proposed changes to the HLW PSAR do not constitute a reduction in commitment or effectiveness relative to design of the HLW melter and the additional of concentrate receipt vessel stub outs. Accordingly, the proposed changes are acceptable and ORP approves the amendments as proposed in 24590-WTP-ABCN-ESH-02-027, Revision 0 with the following conditions:

Conditions of Acceptance - BNI committed to complete the following in the next scheduled HLW PSAR update:

1. Update the HLW PSAR to clarify the inclusion of ITS purge air into the spare process lines (concentrate receipt vessel stub out lines) as committed to in response to Question HLW-PSAR-260. (See Section 3.2, Item 1.)

2. Delete the ABCN proposed addition to HLW PSAR Section 3.4.1.1.2.6, that read: "Subsequent failure of the secondary pipe, should the primary pipe leak, is not eminent (sic) within a reasonable time frame for detection of the primary pipe leak via the cell leak detection system." as committed to in response to Question HLW-PSAR-260. (See Section 3.2, Item 1.)

3. Perform a confirmatory calculation or other documentation that shows that the design of the melter pour spout drip tray accomplishes the bulk confinement of inadvertent melter pours based on melter experience with similar designs and document the results in the HLW PSAR as committed to in discussions with DOE. (See Section 3.2, Item 8.)

4. Revise the appropriate section of Table 4-1 to identify the SDC bulge and SDC lines (primary and secondary) consistent with the ABCN text descriptions as committed to in response to Question HLW-PSAR-260. (See Section 3.3, Item 1.)

5. Revise the PSAR to state that the secondary piping of the concentrate receipt vessel coaxial containment piping will be routed to the wet process cell as committed to in response to Question HLW-PSAR-260. (See Section 3.3, Item 6.)

6. Add the slope requirement for the coaxial containment/spare process piping as an explicit design feature in HLW PSAR Sections 4.3.7.6 and 5.6.2 as committed to in response to Question HLW-PSAR-260. (See Section 3.3, Item 6.)

7. Revise HLW PSAR Section 5.5 to include draft LCOs and surveillance requirements for the melter pour spout drip tray as committed to in discussions with DOE. (See Section 3.3, Item 6.)